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Maerua oblongifolia: Rare Plant of Rajasthan

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ABSTRACT

Maerua oblongifolia belong to family Capparaceae and it is a rare flower of Thar Desert. It is a woody climber which climbs over native tree species viz. *Prosopis cineraria, Tecomella undulata, Salvadora species, Maytenum emeyinale*, etc. Its seed germination is poor and it has many traditional & pharmacological uses. Due to less seed viability and other reason it becomes rare plant and there is urgent need to consume this important medicinal plant.

Keywords: *Maerua oblongifolia*; Capparaceae; Murva; Traditional uses; Germination percentage; Germination value; Average germination value; Average mean germination time; Mean germination time.

1. Introduction

Maerua oblongifolia (forsk) A. Rich in Guill and Perr belays to family Capparaceae. It is rare flora of the Thar Desert and locally known as Orapa (Bhandari, 1990). It is a large scabrous, unarmed, woody climbing shrub with pale-brown smooth bark. It is known by various vernacular name- in English as Necklace berried caper, in Hindi as Hemkand, Potia kand and Waghoti, in Telgu as Bhoochakra gadde, Merupu theega and Putta tige, in kananda as Bhoochakra gedde and nela sakre gedde, in Tamil as Bhumichakkarai, in Sanskrit as Madhusrava, Morata, Murahari and Pipluparni, in Gujarati as Hemkand, and Kale-pinjola in Punjabi as Pilwari, in Rajasthani as Urapa, Marathi as Hemakand, Kaatigoto and Virat etc. In Tibetan it is known as ro ma ha and in Unani as Harasingaar.

It is a woody climber which climbs over *Maytenus emarginata*, *Prosopis cineraria*, *Tecomella undulata*, *Salvadora species* (Rattore & Shekhawat 2011). It is an under shrub bushy plant sometimes scaelent 2-3 meter high with pale brown smooth bark and consists of thick root stock and leaves (Ekero et al 2018). Its leaves are elliptic-obtuse with a pointed end at the apex. Its leaves are petiolate, simple or 1-3 foliolate, stipules are minute and subulate. Roots of *Maerua oblongifolia* consists of a vary stout tap root. It is slender, woody and shaped irregularly. Its roots are slightly yellowish with coconut pulp taste with diameter range from 1-9 cm. Its thick root stock which taste like coconut pulp and is eaten with sugar (Moglad et al., 2014).

The surface of the fresh roots is brownish, smooth with concentric deep furrow and is very soft to touch. Its day roots are dark brown in colour (outside) whereas pale yellow in colour (inside). It dry root are as used as dry of commerce (Madhavan et al., 2012).

Maerua oblongifolia produces aromatic flowers especially during summer seasons. They are strongly scented and greenish-yellow or greenish-white in colour and are arranged in axillary terminal corymbs. Calyx lobes to 1.2cm long and corolla lobes 6-7mm long. Its fruit are Moniliform berry. There are numerous variations in morphology and fruit size, fruits are pale-brown in colour with 8-12 cm long forming an elongated, knotted and twisted one seeded berry. Ripen fruits are rich in sugar and sweet content (Bhalakiya & Nainesh 2019).

1.1. Geographical distribution

Maerua oblongifolia is native to India and distributed in various parts of India. It is reported in Kadape, Kurnool, Anantapur and Visakhapatnam districts of Andhra Pradesh, in Ballari district of Karnataka, in forest area of Maharashtra, in Khurda, Ganjam and Puri district of Orissa, in hilly regions of various districts is Tamilnadu. It is a rare plant in Thar desert. It is also distributed in other countries like Thailand, Srilanka, Pakistan, Arabia, Middle East and Africa (Flora of Peninsular India, 2019).

Plant bears greenish-yellow or greenish -white flowers, in colour and is arranged in axillary and terminal corymbs. Fruits are pale-brows 8 to 12 cm long constricted between the seeds knotted berry having each knot one seeded. *Maerua oblongifolia* exhibits wide variation in fruit size and morphology (Rathore et al., 2005).

M. oblongifolia is threatened plant of semi-arid region of Rajasthan. Plant is woody climber and climb over *Prosopis cineraria, Maytenus emarginata, Tecomella undulata, and Salvadora species* and resembles *Cocculus species*. Plant produces aromatic flowers during summers. The ripe fruits are sugar rich, sweet with high calorific value and are rarely seen as these are eaten by squirrels and birds. *Maerua oblongifolia* can be developed as garden and ornamental plant due to its attractive aromatic flowers. It is highly drought and high temperature for gene prospecting, Plant provide shelter food to birds and animals (Bhandari 1990).

Plant always grow in association with specific tree species as the population of these trees is decreasing day by day due to their over exploitation for fodder, food, timber and for medicinal purpose the plant is also facing threat of extinctions.

M. oblongifolia propagates in nature through seeds. Viability of these seeds is less and most of the seeds are eaten up by the rodents. There is an urgent need for development of non-conventional methods for mass propagation of *M. oblongifolia*. Plant tissue culture as means of non-conventional method of propagation is being applied for conservation and propagation of plant germplasm (Deola & Shekharwat 1995; Rathore et al., 1993; 2007). Highly reproducible and the multiplication rate is very high in protocol developed by researcher (Rathore et al., 1995).

1.2. Study objective

It has aim to find out seed size as well as best germination treatment to grow seedlings. It was also aim to find out any relationship between seed size and germination percentage.

1.3. Micro-propagation Technique

In-vitro regeneration from nodal shoot explants is carried out percent shoots response with multiplication rate (21.1 ±2.33) shoots per explants (30 mm length) was achieved when cultured on semisolid Murashige and Skoog (MS) medium containing 3 percent sucrose and supplemented with 2 mg/liter of (Benzyl amino purine) BAP + additives (25 mg/liter adenine sulphate +25 mg/liter, citric acid + 50 mg/liter ascorbic acid). Further application of shoots was achieved when concentration of BAP was lowered (0.25 mg/site) and Kinetin (0.25 mg/liter) along with 0.1 mh/liter IAA was incorporated in the MS medium. A maximum of 58.1 ± 3.88 Shoots of length 4-5cm were obtained. About 85 percent of shoot rooted (4.04 ± 0.96 roots per shoot) on MS medium containing 3 mg/liter of IBA. After an initial acclimatization period 2-3 months in green house about 80 percent plant were successfully hardened and were then

transferred to earthen pots in nursery. This standard protocol of mass propagation of *M. oblongifolia* eliminates the dependence on natural stands for seed production and will also save for conservation of this threatened species.

1.4. Traditional uses

Maerua oblongifolia is used traditional medicinal system. Its root is mostly used to treat several diseases like fever, diabetes, epilepsy, piles, typhoid, sterility, Stomach ache and some skin diseases. Murva" obtained from the root of the plant is used in several Ayurvedic formulations. Gum paste of plant can be applied for dog bite (Reddy et al., 2019). Ethano-medicinal plants of hilly tract area of east Godavari district revealed that the raw root bulb along with pepper was taken orally to treat diabetes and all these are documents (Raju et al., 2014).

Its tubers and roots are found to be used in general debility and aphrodisiac (Shodhgarya in flibnet.ac.in, 2019). It is also reported that the consumption of the root will help in purifying the blood and keeps the body to cool. Its root has the capacity cure diabetes and inflammatory diseases like arthritis. As per report due to these uses its root has huge demand in public. It is reported that sellers sell its root at high cost (Santosh 2019). Daily intake of 100-150 grams of its 200 tuber along with Jaggery acts as energy stimulant in traditional system in Andhra Pradesh (Savithramma et al., 2016). Its fleshy roots were used for treating of snake bites and Scorpion stings and the root is used as alternative tonic and stimulant (Revolvy 2019). In one report it is mentioned that the plant is used to treat Hypo cholestrolcemia, malaria, adnominal pains and used astringent (Mohamed et al., 2010). Its roots are used as stimulant and the extract of the root is used to treat convulsions and epilepsy (Thakor & Alpesh 2009). Paste of crushed root of *Maerua oblongifolia* is used to treat cough and cold in children especially by applying the paste over the chest region (Punjani &Vivek, 2002). Paste of the stem of plant is reported to be used to treat skin diseases and also to cure leucorrhea whereas the entire plant sap is used in blood purification (Patel et al., 2010). Plant leaf is crushed and homogenized in water and then the water is taken orally to facilitate digestion and used to treat stomach ache and abdominal pains (Meragiaw 2016). Gall part of *Maerua oblongifolia* is used to treat asthma some skin diseases (Al-fatimi et al., 2007).

1.5. Pharmacological Activities

(A) Anti-pyretic activity: Aqueous and alcoholic extract of *M. oblongifolia* on wistar albino rat to study anti-pyretic activity by yeast inducing pyrexia. It was found that within 30 minutes of their administrations, the aqueous and alcoholic extract reduced the elevated rectal temperature in febrile rates. Maximum temperature reduction was observed after 120 minutes. It indicates its anti-pyretic activity (Madhavan et al., 2010).

(B) Antifungal activity: In an experiment medicinal plant extracts were used on 5 phyto pathogenic fungi and result indicate that the aqueous extract *M. oblongifolia* leaves is able to inhibit the mycelial growth by 36.9 percent and spore germination by 69.1 percent of following fungal species such as *A. solani*, *B. fabae*, *A. brassicae*, *F. oxysporum*, *P. infestans* (Baka 2010).

(C) Anti-microbial activity: Toothbrushes prepared from *M. oblongifolia* and other plant species to screened its efficacy against Gram positive bacteria (*Bacillus cereus*, *Staphylococcus mutans, Lactobacillus acidophilus and Staphylococcus aureus*), Gram negative bacteria (*Escherichia coli* and *Klebsiella pneumoniae*) and two yeasts

(*Candida albicans* and *Cryptococcus neoformans*) to establish scientific evidence for the use of these toothbrush to maintain oral hygiene. Results indicate that plant shows moderate to good antimicrobial activity (Vuuren et al., 2006).

(D) Chemotaxonomic activity: Ethanol extract of the roots were used in the study chemotaxonomic relationship between phenolic components. Based on the roots phenolic compounds, it was found that paired affinity exists between *M. oblongifolia* and *Schimpera arabica* at highest level (Hamad et al., 2017).

(E) Aphrodisiac activity: In an ethanomedicinal survey the plants used by the tribes of North Coastal Andhra Pradesh it was found that about 45 plants can be used for aphrodisiac. Out of 45 species it was found that *M. oblongifolia* and *Zaleya decandra* found most effective. Its dried root bark powder mixed with half spoon of honey given once a day for 2 mouth and it was found effective showing aphrodisiac activity of *M. oblongifolia* traditional system (Rao et al., 2018).

(F) Wound healing effect: Plant powder extracted with ethanol used to study wound healing activity using albino rats. After15 days treatment it was found effective (Arulanand et al., 2018).

(G) Anti-convulsant activity: To investigate anti-convulsant activity experiment was done on albino mice using two extracts (ethanolic and aqueous) of root powder. Results shows that both extracts of *M. oblongifolia* root at the Concentration of 200 and 400 mg/kg has reduced the extensor phase and the recovery times in MES induced seizures where as in Pentylenetetrazole (PTZ) induced convulsions both extracts of different doses had delayed the onset of convulsions and reduced the recovery time (Sundara & Madhavan, 2016).

(H) Antidiabetic activity: *M. oblongifolia* effect to find anti-diabetic activity was studied using alloxan induced Swiss albino mice. It was fond that aqueous extract of the root at the concentration of 800 mg/Kg showed significant reduction is blood glucose level (Arulanandraj 2011).

1.6. Phytochemical constituents

It is investigated that *M. oblongifolia* has isothio cyanate glycosides, 2 linear triterpenoids, 3 hepane triterpenoids, 6 fatty acid derivatives (Palmitic stearic acid, oleic acid, Palmitoleic acid Stearic acid, oleic acid and linoleic acid). Its tuber content has total ash 8.28 percent, Acid insoluble ash 1.73 percent, water soluble extractive 16.73 percent and alcohol soluble extractive 8.73 percent (Abdel-Mogib et al., 1999).

2. Material and Methods

Seeds of *Maerua oblongifolia* were collected and after proper cleaning and drying they were stored for further analysis. Seed length, width and thickness were recorded for 100 seeds of each seed lot. The seed germination tests were performed in seed germination Laboratory of Silviculture and Forest Management, ICFRE- Arid Forest Research Institute, Jodhpur. With the help of seed counter machine seeds per kilogram were calculated. Laboratory test on the germination response of seeds to pre-germination treatments of Hot water, GA_3 (500 and 1000 ppm) and IBA GA_3 (500 and 1000 ppm) compared to untreated seeds (control). Soaking Hundred seeds in hot water for 15 min. Twenty seeds were also soaked in GA_3 (500 and 1000 ppm) and IBA GA_3 (500 and 1000 ppm) for 6 hours. All the pre- treated and untreated seeds were rinsed thoroughly in distilled water and were placed in germination tray.

The experiment was carried out at room temperature in the laboratory. Seeds were considered germinated upon plumule emergence. The number of seeds that germinated was recorded while the percentage seed germination was calculated. Following procedure was made for different parameters determinations:

2.1. Formulas for various calculations

(A) GP (Germination Percentage) = (Total number of seeds germinated/total number of seeds tested) × 100

Final Germination Percentage (FGP %) = Final no. of seeds germinated in a seed lot × 100

The higher the FGP value, the greater the germination of a seed population [Scott et al., (1984)].

(B) MGT (Mean Germination Time) = Total (daily germination) × 1 days /total seed sowing

Mean Germination Time (MGT day) =Σf ·x/Σf

f=Seeds germinated on day x

The lower the MGT, the faster a population of seeds has germinated [Orchard (1977)].

- First Day of Germination FDG day = Day on which the first germination event occurred

Lower FDG values indicate a faster initiation of germination [Kader (1998)].

- Last Day of Germination LDG day = Day on which the last germination event occurred Lower LDG values indicate a faster ending of germination [Kader (1998)].

- Germination Rate Index GRI (%/day) = G1/1 + G2/2 +· · ·+ Gx/x

G1 = Germination percentage × 100 at the first day after sowing, G2=Germination percentage × 100 at the second day after sowing.

(C) AVG MGT (Average Mean germination time) = Total MGT/Total number of days.

(D) GV (Germination Value) = (Total MGT/total germination) × (GP%/10).

(E) AVG GV (Average Germination Value) = Total GV/Total number of days.

3. Result

Seeds collected from the Kaniwada, Kota which shows average mean seed length 4.64±0.06 and average mean seed width was 4.76±0.18. Germination using different treatment shows range from 6.67 percent to 60 percent. With control 60 percent germination was achieved while GA_3 500 ppm was 6.67 percent and GA_3 1000 ppm it was 26.7 percent. Hot water treatment give 33.3 percent germination seed parameters viz. Total mean germination and average mean germination value were also calculated using proper formula.

4. Conclusion

Maerua oblongifolia is an important Ayurvedic plant used in many Ayurvedic formulations. It is the main constituent of "Murva" which is used to treat various diseases like stomach ache Urinary calculi, diabetes, skin problems, epilepsy and fever. Further research on its scientific evidences as medicinal properties needed. As its

seed viability is less and they were eaten up by the rodents so plant is going to have threat of extinction. Though, through micropagation and other conservation approach work is going on to save this plant.

5. Future Suggestion

Variation in seed size and germination behaviour in different seedlots indicates that not only edaphic or climatic variation but genetic makeup can also play role in the germination. It is suggested to study reproductive biology as well as detailed studies on different seedlots from various agro climatic regions.

Declarations

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Competing Interests Statement

The authors declare no competing financial, professional, or personal interests.

Consent for publication

The authors declare that they consented to the publication of this study.

Authors' contributions

All the authors took part in the literature review, analysis, and manuscript writing equally.

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Table 1. Seed size and germination data in *Maerua oblongifolia*

S.N.	Location	GPS	Date of collection	Seed Analysis						
				Mean length	Mean width	Germination parameters				
						Treatments	GP %	Total MGT	Total GV	Avg MGT	Avg GV
1	Kaniwada, Kota	N 25°20' 11"	29-01-2021	4.64± 0.06	4.76± 0.18	Control	60	123.87	1449.7	5.63	65.9
		E 72°41'03"				Hot water	33.3	73.87	762.6	3.358	34.66
						GA_3 500 PPM	6.67	15	150.1	0.682	6.822
						GA_3 1000 PPM	26.7	60	600.8	2.727	27.31

Figure 1. Seed collection of *Maerua oblongifolia*